

**Amendment and Response**

Serial No.: 09/893,199

Filed: June 27, 2001

Docket No.: 10277US01/201.183.101

**REMARKS**

This Amendment is responsive to the Office Action mailed April 4, 2005, in which claims 26-38 were rejected. With this Response, claims 26-28 and 33-35 have been amended. Claims 26-38 remain pending in the application and are presented for reconsideration and allowance.

**Claim Rejections under 35 U.S.C. § 112**

Claims 26-38 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Specifically, the Examiner has stated that it should be clarified in claims 26 and 33 that the urethane curing reaction is the one that takes place within approximately 12 minutes and not the reaction of the actinic monomer. Applicant has amended claims 26, 27, 33 and 34 to state that "at least about 70% of isocyanate groups present in said aliphatic polyisocyanate are reacted" within the time frame required in each individual claim. As the Examiner has noted, this language has basis in the specification.

In view of the above, Applicant respectfully requests that the Examiner withdraw the rejection under 35 U.S.C. §112, second paragraph.

**Claim Rejections under 35 U.S.C. § 103**

Claims 26-38 are rejected under 35 U.S.C. §103(a) as being unpatentable over Dhar et al. (EP No. 0945762) in view of Ueda (JP 05-323850) and Chang (U.S. Patent No. 4,547,478) combined with Keys et al. (U.S. Patent No. 4,965,152 and/or JP 06-282209) and Sommerfield et al. (U.S. Patent No. 5,985,998). Applicant respectfully traverses the rejections for the claims as currently pending.

As Applicant has previously pointed out, neither Dhar nor Ueda nor Chang disclose that the dimers or trimers of 1, 6-hexamethylene would be advantageous to use in holographic media. Rather, Dhar discloses a variety of useful matrix precursors and prefers a mercaptan epoxy step polymerization. In Dhar, acceptable time frames are stated (page 5, lines 16-17) to be up to 300 minutes. In Ueda, aromatic secondary diisocyanates are preferred, and in paragraph [0048],

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where 1,6 hexamethylene diisocyanate is mentioned, it is in a mixture of isocyanates which includes tolylene diisocyanate and the disclosure continues in paragraph [0049] to describe the use of the tolylene diisocyanate to be especially desirable. Likewise, the triisocyanate mixture disclosed includes at least one aromatic diisocyanate. There is no disclosure of limitation to aliphatic diisocyanates, or a preference for such limitation. Further, despite the Examiner's contention that increase in speed is always of concern to one skilled in the art, assuming that every reference must teach such a motivation is incorrect. Many inventions are directed to improving specific characteristics of the end product that either do not relate to speed of a reaction, or that will actually slow a reaction rate, but produce a more desirable or purer product. It cannot be assumed that Dhar or Ueda would prefer selection of an isocyanate that will produce a faster reaction, and that therefore the combination of such references with references teaching that primary diisocyanates would react faster would be obvious to one skilled in the art. Further, Dhar focuses on durability, which is often a property which will, when attempts are made to increase durability, cause slowing of speed of production. Dhar focuses on weatherability, and teaches that as the important focus of the selection process in this reference; again, see paragraphs 71 and 72.

Further, neither specifies that at least about 70% of the isocyanate groups should be reacted within 12 minutes as required by the current claims.

Chang, while acknowledging that primary diisocyanates react faster than secondary diisocyanates using the tin-lead catalysis of the day (1985), is directed to the development of catalysts and co-catalysts which can improve the reaction time of secondary and tertiary diisocyanates to make them useful in products previously only makeable with primary diisocyanates. Chang discloses the problem of slow reactions in the context of the field of reaction injection molding, which "requires polyurethane reactions on the order of seconds," see column 1, lines 38-48. While it might be obvious to try primary diisocyanates in the medium of Dhar, it would not be obvious to one skilled in the art that dimers and/or trimers of 1,6-hexamethylene diisocyanate would exhibit an excellent combination of high photosensitivity, reaction time within 12 minutes, and the appropriate viscosity. Further, neither Dhar nor Ueda supply any motivation for trying to decrease the reaction time to a time frame of twelve minutes or less. Dhar's preferred time is under 200 minutes. All of the polyurethane precursors tested by

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Applicant including the poly(tetramethyl glycol) polyisocyanate having the isocyanate groups attached to secondary carbons polymerized in well under 200 minutes, with 70% of the isocyanate groups of the poly(tetramethyl glycol) reacting within 60 minutes. These time frames are perfectly acceptable to the inventors of these references, and it cannot be simply assumed by the Examiner that those inventors would, if aware of the faster time of reaction of the primary diisocyanates, prefer such a time frame. Some motivation to use the primary diisocyanates of Chang must be found within the other references, and not merely inferred by the Examiner based on the preferences and limitations taught by the current invention, and/or on the general perception that increased productivity is always desirable in industry. To do so would be to create a rejection which would render all inventions which increase speed or productivity obvious over any previous slower processes or reactions in the same field.

Keys teaches the use of ethylenically unsaturated monomers such as halogenated acrylate monomers in a photopolymeric film containing a mirror formed by a reflection hologram; however, there is no teaching of polyurethane precursors to form a matrix. The binder which serves as a matrix (column 4, lines 30-63) comprises a polymeric material such as polyvinyl butryal, polyvinyl acetate, etc. No in-situ formation of the binder is disclosed, no polyurethane matrices are disclosed, and certainly no specific diisocyanates are disclosed. For these reasons, Keys cannot be readily combined with the previous references to render obvious the use of halogenated acrylate monomers with polyurethane matrices such as those in the present invention. Applicant also respectfully disagrees with the Examiner's combination of JP 06-282209 with the previous references. JP 06-282209 does not teach the use of such monomers with polyurethanes, but rather with polyesters. JP 06-282209 does not teach the use of halogenated acrylate monomers with aliphatic polyurethane diisocyanates which comprise dimers or trimers. Since JP 06-282209 does not disclose any polyurethane precursors used with such acrylate monomers to form polyurethane matrices, Applicant submits that the disclosure of this reference would not logically be combined with the previous references by one skilled in the art.

The Examiner has stated that Sommerfield et al. '998 teaches the use of trimers of hexamethylene diisocyanates to form polymeric networks/matrices which include monomeric materials. Applicant respectfully again disagrees with this characterization of the reference.

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Sommerfield et al. '998 discloses a type of interpenetrating polymer network (IPN) having at least two catenated polymer networks. Those networks maybe comprised of any of a large variety of polymer systems, see column 11, line 44 through column 12, line 45. The networks include additional polymerizable monomers and photosensitive compositions. However, the trimers which the Examiner cites (column 21, lines 35-46) are not disclosed by Sommerfield as part of the IPN, but rather under the discussion of types of optional components. It is taught at column 20, lines 40 through column 21 line 46, that where the photopolymerizable composition is to be used as a permanent coating, a chemically or thermally activated crosslinking agent may be added to aid in the interlocking of the two networks and provide properties such as chemical resistivity. This is a conventional use of a polyisocyanate as a crosslinking agent for polymer networks, as the diisocyanate will assist in interlocking the two catenated polymer networks, and will not be part of one of those networks. For this reason, Sommerfield et al '998 does not teach nor suggest, either alone, or in combination with the other references, the use of dimers or trimers of 1,6 hexamethylene diisocyanate along with a polyol as a matrix to be polymerized around the addition polymerizable monomers. Nor does it teach or suggest that in such a matrix that at least about 70% of the isocyanate groups will be reacted in 12 minutes. Therefore, it would not be obvious to one skilled in the art to use the crosslinking agents of this reference as the matrix in the device of Dbar or Ueda. It would not be obvious from this combination of references that the use of such dimers or trimers as the matrix would provide the benefits shown by Applicant, or indeed that the benefit of lessened time for the reaction of such a matrix would be desirable.

The combination of references teach only that diisocyanates of various types are useful in holographic media and that primary diisocyanates are faster reacting than secondary diisocyanate. The references also teach that 1,6 hexamethylene diisocyanate is useful in forming polymeric matrices. However, the references also prefer aromatic isocyanates for using holographic applications and list numerous other possibilities for useful isocyanates. The Examiner has, using hindsight and the disclosure of Applicant's specification, selected those paragraphs which, when combined, identify one or more of Applicant's ingredients. One skilled on the art would not find it obvious to selectively pick and choose various elements from these several references to achieve the combination claimed by Applicant.

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Claims 26-38 are rejected under 35 U.S.C. §103(a) as being unpatentable over Dhar et al. (EP no. 0945762) in view of Ueda (JP 05-323850) and Chang (U.S. Patent No. 4,547,478) combined with Keys et al. (U.S. Patent No. 4,965,152 and/or JP 06-282209) and Sommerfield et al. (U.S. Patent No. 5,985,998), further in view of Sugiyama et al. (U.S. Patent No. 5,446,086 or Mizuno et al. U.S. Patent No. 6,455,147) combined with Sato et al. (U.S. Patent No. 5,702,846).

Dhar, Ueda Chang, Keys and Sommerfield have been discussed above.

Sugiyama et al. '086 discloses a broad class of polyoxymethylene compositions for molding having improved heat stability. Several embodiments are disclosed, with each embodiment having a large list of possible ingredients for a total of many classes of chemicals, which are taught to be suitable to use in molding compositions. One embodiment of the composition (Formula IV) includes a thermoplastic polyurethane. A large class of isocyanates and derivatives are listed, including diisocyanates and dimers and trimers of the listed compounds. Such compounds are stated to be preferable for reasons related to coloration and handling safety considerations. Applicant believes that there is no reason why a skilled artisan would refer to such a non-analogous reference such to determine what diisocyanates would be useful in photopolymer data recording media, and what viscosities, and curing rates those diisocyanates would have in the context of such an application. Applicant further argues that the vast array of chemical choices in Sugiyama would require extensive testing to choose specific ingredients from those listed. It would not be obvious for a skilled artisan formulating an unrelated product to choose the specific dimers and trimers of the claimed diisocyanate and combine them to form a matrix in which ethylenically unsaturated monomers would be imaged holographically. Without knowledge of Applicant's specification, the skilled artisan would not go through the wide variety and choose only those compounds used by Applicant.

Mizuno et al discloses a reaction-injected urethane foam. While aliphatic isocyanates are disclosed, and dimers and trimers are disclosed as being non-yellowing, there is no reason why a skilled artisan would refer to such a non-analogous reference such to determine what isocyanates would be useful in photopolymer data recording media. One skilled in the art would not look to a foam urethane to provide useful information regarding urethanes useful for use in holographic photopolymer recording

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The Examiner has stated that the non-yellowing characteristics would be advantages desirable in the inventions of the other references. However, Mizuno is non-analogous art to Applicant's invention. One skilled in the art would not necessarily be familiar with Mizuno nor would he be expected to be. It is well settled that an inventor is not expected to know teachings in all the arts. Urethanes are used in many industries and many non-analogous applications such as foams and shoe soles, mattresses, car parts and the like. A simple search of the term urethane reveals over 70,000 patents which pertain to urethane since 1976 and over 30,000 refer to diisocyanates. It is obvious from this number that simply having a urethane content does not render any art containing a urethane analogous art. One skilled in the art could not be expected to be knowledgeable of what is disclosed in this vast number of documents.

The Examiner has cited Sato et al. for the teaching that yellowing of the polymeric hologram film is undesirable. However, Sato does not teach use of dimers or trimers of 1,6 hexamethylene diisocyanate but rather use of a cationic polymerizable compound with a radically polymerizable compound, at least one of which must have a siloxane group. Sato teaches that the cationic compounds disclosed have higher compatibility with either compounds. Therefore, Sato would teach away from using compounds such as a dimer or trimer of 1,6 hexamethylene diisocyanate as such compounds are not listed among the polymerizable compounds at column 3 of Sato. Sato discusses yellowing at column 6, lines 1-15, as a problem which can be avoided by choosing the correct cyanine dye as the sensitizer in the radical polymerization initiating material. Sato does not teach dimer and trimers of 1,6 hexamethylene diisocyanate as non-yellowing. The fact that Sato teaches the problem of yellowing does not mean that one skilled in the art of holographic media would be familiar with the teachings of all patents relating to isocyanates and whether they yellow or not in totally different types of products such as those disclosed in Mizuno or other nonanalogous references. Therefore, Applicant does not agree that the combination of Sato and Mizuno when added to the other references render Applicant's claims obvious. Again, the Examiner has used hindsight and the disclosure of Applicant's specification to combine references which identify one or more of Applicant's ingredients as one of multiple possible ingredients or disclose one of many required factors, and then quilted together a combination rejection which would not be possible without knowledge provided by Applicant's invention. One skilled on the art would not find it obvious to

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pick and choose the specific elements from these several references to achieve the combination claimed by Applicant.

In view of the above, Applicant respectfully requests that the Examiner withdraw the rejections of the claims as unpatentable under 35 U.S.C. §103 over the references.

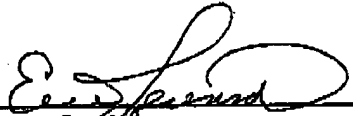
**CONCLUSION**

It is believed that no fees are due by reason of this amendment. However, if this is incorrect, please charge any additional fees, or credit any overpayment to Deposit Account No. 09-0069.

Applicant believes that all claims are now in condition for allowance. Early and favorable consideration is requested. Any inquiry regarding this Amendment and Response should be directed to Eric D. Levinson at Telephone No. (651) 704-3604, Facsimile No. (651) 704-5951. In addition, all correspondence should continue to be directed to the following address:

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